The work is of the highest geological importance, and in spite of its necessary descriptive details, every page contains observations of interest. The account of the Torridonian series, for example, describes the oldest considerable land surface known, and some traces of fossils in these pre-Cambrian rocks. The part of most interest is the account of the movements by which the eastern gneisses have been overthrust on to the younger rocks. The movements have taken place along a line more than 100 miles in length, and have carried the rocks in places for ten miles westward. The thrusting forward of these hard rock slices has produced a most intricate system of faults, and extreme changes in the rocks, some of the fresh structures, as in the pseudo-rhyolites, simulating those of igneous rocks. The extent of the metamorphism is one of the secondary questions of most interest. Its range appears to be very variable; in places the alteration is confined within very narrow limits; elsewhere it may extend to a mile from the plane of movement; but it never appears to be regional, and evidence is given that some of the schists had their present structures before the great disturbances. The problems connected with the eastern schists are handled with reserve, as there seem to be marked differences of opinion as to their age and origin; but on the main question, the relation of the schists to the fossiliferous rocks, the memoir, with its convincing combination of fulness of detail and clearness of exposition, leaves no room for doubt.

J. W. GREGORY.

THE TOTAL SOLAR ECLIPSE OF JANUARY 3, 1908.

THE first cablegram, containing news relating to the eclipse of January 3, observed by the parties stationed on Flint Island in the South Pacific, reached this country on Saturday last. The cable was from Mr. F. K. McClean, and was dispatched immediately on his arrival at Auckland, New Zealand. It read as follows:—"Partial success, fine morning, heavy rain several minutes until totality; first minute cloudy, remainder clear. Four corona results; none spectrum; bad plates; other observers not developed. Campbell reports success."

The above news is really very satisfactory, because it was anticipated by those at home that the weather conditions which generally prevailed at that time of the year would most probably prevent any observations at all being made. There is, however, no doubt that the parties were very fortunate, since, according to the above account, the clouds only just cleared from the neighbourhood of the sun in time.

Those who have been on like expeditions will be able to picture to themselves the anxiety which must have prevailed among the observers as totality was approaching. The heavy rain must have necessitated the covering up of all the instruments, more especially the silvered mirrors and object glasses. The clearing up, after totality had begun, must have created a condition of affairs which was probably not legislated for in the "rehearsals" which had no doubt been daily gone through.

The fact that the length of totality was of four minutes' duration gave probably sufficient time for all the instruments to be brought into use. It is hoped, therefore, that a very complete record has been obtained of the latter portion of totality, and, if this be so, then the term "partial success" may be changed to complete success.

With regard to actual results obtained little is known at present. The reason of this is that the development of the negatives secured was not completed on the island. Mr. McClean provided himself with a dark room on board the steamer he had chartered, so he may have developed his corona negatives on his way back to Auckland. According to his cable four of the plates he exposed were successful, but the words "bad plates" seem to suggest that the results he obtained were not so good as they might have been.

Reuter reports that the observations of the different parties at Flint Island and Samoa were, generally speaking, fairly successful, and mentions specially that the bolometric measurements of the heat of the corona made at Samoa were successfully made.

WILLIAM J. S. LOCKYER.

THE BRITISH SCIENCE GUILD.

THE second annual meeting of the British Science Guild was held on January 15 at the Mansion House, the Lord Mayor being in the chair. The large assembly of fellows and members, and the presence of distinguished representatives of many departments of intellectual activity and national interest, show that the Guild is strengthening and extending its influence over a wide field.

The report, which was adopted, referred to the missionary work of the Guild in educating the public in the following terms:—

> The executive committee believes that in this direction the labours of the Guild are becoming more effective each year, and there is a gradually increasing volume of opinion chronicled or expressed in the daily and weekly Press in harmony with the main objects of the Guild.
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> For this result a large debt of gratitude is due to the president, Mr. Haldane, who has taken many opportunities of expressing and emphasising the views of the Guild before large audiences in connection with various educational institutions.
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> It is in the direction of primary education that the most rapid advance in public opinion has taken place, and on this the nation is to be congratulated, for it is on the proper education of the children that all future progress must ultimately depend. At the inaugural meeting of the Guild in 1905, the chairman of committees, in referring to the subject of education, pointed out that a complete education must be based upon things and thinking as well as words and memory, and that we want "one kind of education for everybody—the Best." Further, that no one should be stopped on his upward course save by his own incapacity; and that all impediments should be removed. These views are now being acted on in many places.
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> The Guild is not alone in pointing out that our great commercial competitors are those lands where there is the greatest number of complete and State-aided universities, and in which as a consequence "all the national activities are carried on in the full light of modern science by men who have received a complete training both in science and the humanities, in close touch with the Governments."

Some of the City livery companies have shown great interest in the work of the Guild. The Clothworkers' Company has made a donation of 100*l.* to the funds, and the Drapers' Company one of 105*l.* This evidence of the interest taken in the movement is very gratifying, and it is hoped that other City companies will similarly assist in furthering the objects of the Guild.

Numerous subjects have occupied the attention of the executive committee during the year, and several deputations to various Ministers of State have been arranged. Among questions thus dealt with may be mentioned the amendment of patent laws, the anthropometric survey of school children and adults, and the prevention of pollution of rivers. Deputations had also been planned to the Colonial Premiers and in connection with vivisection licences, but subsequent circumstances made these unnecessary.

In addition to this work of the executive committee, committees have been appointed by the Guild to deal with education, inexpensive apparatus in science teaching, agriculture, chemical industries, the Franco-British Exhibition, postal reform, and biological subjects.

The question of university endowments has received the earnest attention of the Guild; and the following considerations relating to it are stated in the report:—

> The necessity for increased endowment has been, to a large extent, conceded, especially by the last Chancellor of the Exchequer, Mr. Austen Chamberlain. In 1904 the then endowment was increased, and a still greater increase was promised. But it was pointed out that, until the universities themselves had considered to what extent they were willing to come under inspection, it was difficult to deal with the question of still higher endowments.
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> The existence of large college endowments at Oxford and Cambridge places these universities in a different position from the rest, although the small endowments of the universities themselves are felt as strongly as in the other universities.
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> The Scotch universities, like Oxford and Cambridge, receive no Government assistance. The University Act of 1889 gave to the Scotch universities, not as a boon or gratuity, but as an absolute right, 42,000*l.* a year. This represented obligations which the Government had taken upon itself when it assumed possession of property which belonged to the universities, and which, had it remained to them, would have brought in a larger revenue. In 1892, 30,000*l.* a year was added; it was not a special grant from Government, but came entirely from the Scottish Local Taxation Fund, in which no other part of the kingdom had any concern. England might, had it pleased, have assigned a share of the English Local Taxation Fund to the universities, but she did not do so.
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> Whether or no it is desirable that a large proportion of the college funds at Oxford and Cambridge be applied to various branches of real university teaching and of post-graduate research is a matter on which members of the Guild might have much to say.
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> It is also hoped that in time the new universities will be provided with funds for the establishment of hostels, such as the Oxford and Cambridge colleges are to a large extent. This provision, however, may fairly be made in the case of the newer, as of the older foundations, by private munificence, and not by Government aid.
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> The ultimate aim should be State, municipal, and private endowment for all universities.
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> Universities supported entirely by municipalities are impracticable, as the influence of a university must extend over a large area, which will increase as its specialisation is proceeded with; this renders the application of local rates, and therefore local control alone, unfair and undesirable.
>
> It is possible that the old English universities themselves would be among the first to welcome an inquiry which might consider the best way of placing matters on a more satisfactory footing.
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> In July the question of a Royal Commission on the older universities was brought forward in the House of Lords by the Bishop of Birmingham. Lord Crewe, in communicating to the House the decision of the Government, stated, "it is important for us, before arriving at a final conclusion, to know what the most thoughtful and the most competent opinion at both universities really demands, and we also must either inform ourselves or be informed exactly what the universities cannot do of their own motion, and for what purposes legislation would be required."
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> In consequence of this decision no further action has so far been taken by the executive committee.

After the meeting had been opened, Mr. Haldane, Secretary of State for War, and president of the Guild, gave an address to the members. For the subjoined report of his remarks, and of those made by Dr. T. H. Warren, vice-chancellor of the University of Oxford, we are indebted to the *Times* of January 16:—

> Mr. Haldane said that the Guild was a body of people who had come together for the purpose of organising interest in science, an interest which had not been, as they thought, sufficiently great. It also aimed at assisting those who had scientific objects to accomplish to find the means of accomplishing them. They endeavoured to stimulate successive Governments. Governments were very apt not to be quite as scientific as everybody might desire, and the most perfect embodiment of the work of the Guild was when they got the two functions combined. For instance, the War Minister in this country was apt to take an easy-going view of organisation, but if the president of the Guild was always at his elbow to remind him that what he was doing was unworthy of one who was acquainted with the principles of the Guild, then something was gained, and if the two happened to be rolled up into one person physically who could divide himself spiritually into two, then they had an ideal combination. It was encouraging to see signs of progress everywhere in this country. Only that morning he had seen the announcement that Mr. Wills had offered the University College of Bristol 100,000*l.* if it was incorporated into a University of Bristol. This enterprise would come within the range of the criticisms of those who complained of small universities, but the matter had been threshed out before the Privy Council when the question of the granting of a charter to the University of Liverpool came before it. The special committee of the Privy Council selected to give a judicial opinion on that question pronounced in favour of an increase in the number of universities in England. That policy had been carried out with the utmost success. An extraordinary development was going on just now in the direction of the application of science to industry. At Armstrong College, Newcastle, which was a part of the University of Durham, he found the other day a change which he could hardly have credited had he not witnessed it. In certain buildings there were organised the scientific foundations of the shipbuilding industry in a fashion which was beyond praise. The professors of mathematics, of engineering, of physics, of applied mechanics, of designing were all working with one purpose, which was to provide a school of the university type, for, among other people, those who were to be engaged in the practical business of shipbuilding. On the other hand, the shipbuilders on the Tyneside were sending up their young men in order that they might acquire knowledge of the principles of the construction of compound engines, and how to solve the thousand and one problems constantly coming up in the construction of a great liner. The effect of that was immense, not only in stimulating the interest in university work, but upon the great industries in the neighbourhood. He saw the same thing at Sheffield. Part of the university looked very much like a steelworks. There were places with great crucibles and all the apparatus for the purpose of casting steel. There were brawny workmen there, obviously come from the works, and students of the university were working with them and mastering that most important work of metallurgy. He did not suggest that they should bring down the university to the simple function of applying science to industry—far from it—but they would gladly see in our provincial centres, which the Universities of Oxford and Cambridge could not reach, facilities given which existed in other countries, but did not exist in our own country. He wished God-speed to the new enterprise, and he knew that his colleague in the Government, Mr. Birrell, who sat for the city of Bristol, was deeply interested, like himself, in the success of the movement. This year, moreover, the Government had in its programme the giving of teaching of a university type in an enlarged and extended degree to Ireland. Ireland had one great university, the University of Dublin, consisting of Trinity College, but they felt that, valuable as was the work and greatly to be reverenced which the University of Dublin had done, it could not provide for the needs of the Irish people, who suffered much from there being no outlook, no career for the talent of their young men, and particularly of the Catholic and middle classes. The Govern-

ment had to provide education, not of a sectarian kind, but in an atmosphere which would not offend sectarian prejudices. The negative was a very different thing from the affirmative in that matter, and if that was attained he did not see why education could not be given to Belfast and Dublin, to the Presbyterians and Catholics of Ireland alike, an education of a university type which would not run athwart those feelings and considerations which obtained to so high a degree among the Irish people. That was a step in the direction of solving a very difficult problem which had embarrassed Governments before now and which might embarrass this one, but they hoped to try, and it was a sign of the times that they should try. In Scotland a step forward in the spirit of that guild had been taken very recently. They had brought the teachers into close relation with the Scottish universities. The training of those teachers used to be undertaken by the churches. It was no want of reverence or respect for the churches which led him, speaking from that platform, to say that in Scotland they preferred that the universities should train their teachers rather than that they should be trained in any denominational atmosphere, however excellent. He was not touching in the least on the question of denominational colleges. The university, after all, ought to be at the head of education, and to permeate downwards, and could not do that unless it trained the teachers for the work. It was not only in the direction of university teaching that the signs of the permeation of the new spirit were to be seen, and in the departments of the Government numerous little things had happened lately to show how progress was being made. In these days science was becoming more and more of moment in the race between nations. No industrial community could retain its place unless it had got the highest science at its disposal. If he were to adopt a motto for that guild, it would be the motto of a German trade association, which ran :—" Science is the golden guiding star of practice; without science there can be only a blind groping about in the region of undefined possibilities." The change that had come over things in the last fifty or sixty years was immense. Without science no one could organise his business; without science no nation could keep its place in the van. Therefore he said that one of the great responsibilities of a nation was not only to keep her knowledge in the minds of a few individuals abreast of the age, not only to produce her Kelvins and her Darwins, but to see that her science was disseminated, and that it had entered the minds and actuated the endeavours of her captains of industry generally. That was the creed of that guild, and that was the lesson which they had come together to endeavour to teach.

In moving the adoption of the report, the Vice-Chancellor of Oxford said that in the report they would find some remarks and some criticism, implied rather than developed, upon the older universities. Speaking for Oxford, he did not deprecate that criticism. He desired measures and large measures of reform in Oxford and her colleges. He did not agree with his friend the Bishop of Birmingham in invoking as a first step the interference of the State. He would like to see Oxford reform herself. But he fully recognised that when the Government had given her, as it had, this opportunity of doing so, if she failed to use that opportunity this Government, or any other Government, would have strong justification for stepping in and reforming her from outside. He wished to see reform both in her constitution and her curriculum, both in the colleges and the university. On what lines should that reform proceed? He would say on the lines indicated by the British Science Guild. They would find in the report a suggestion that college funds might be more largely used to aid the university. He believed they might, and he believed they ought to be more largely used in this way. But they would find also a recommendation that the new universities should be provided with funds to establish hostels such as the colleges at Oxford and Cambridge very largely were. He took it that the British Science Guild did not want to abolish the colleges. He certainly thought that would be a pity. Hostels they were, but they were something more than hostels. Some would say they were only glorified hostels. He would say they were glorious hostels. Trinity College and King's College at Cambridge and Christ Church and New College and Magdalen at Oxford—he thought all who knew them would agree that they merited that description, and that their glory was part of the educating influence and the attracting spell of the older universities, that they were an academic, aye! and a national asset which it would be folly to throw away or destroy. In the appendix to the report there were some remarks about the tardy and sluggish response on behalf of the private benefactor to the appeal of the University of Cambridge, to the unattractiveness of the universities generally to the benefactor. To bring that appendix up to date mention should be made of a new fact. The president had brought the report up to date by referring to the splendid gift that was announced in the *Times* of that morning, the gift that one of the heads of a great and generous family in the ancient city of Bristol had made to its college. Might he, as an old Bristolian, ask them to send their thanks to that generous family which had already done so much for that city, and had now come forward with this benefaction? He remembered the famous motto in which Bob Lowe suggested that money might be made out of matches—*ex luce lucellum*. He thought the Wills family had taken a better motto. Theirs seemed to be *ex fumo dare lucem*. They had all read, a few weeks ago, of the magnificent bequest left by Sir W. Pearce to the Royal and religious foundation of Trinity College, Cambridge—money made, by the way, in applied science; it was enough to make, and he believed made, mouths water, not only in the University of Cambridge, but in the other colleges of Cambridge, and in some colleges in Oxford too. For his part he welcomed that bequest. He congratulated his old friends of Trinity College. It was a great example. If Trinity used it well, and he believed the college of Newton and Clerk Maxwell, and Macaulay and Tennyson, would use it well for the public benefit of the university, not for any self-aggrandisement, it would be a greater example still, and might well prove contagious. He thought that college funds should be used much more largely for the university, and that the college should be brought into closer and more responsible relation with the university. He thought, too, that the university needed reform in its curriculum. If there was anything about which he had been persistently keen all through his academic course it had been the desire to introduce science into the regular and compulsory curriculum of Oxford, to ensure that everyone who took the ordinary degree should at least know what science and the scientific attitude of mind were like. But he did not want literature excluded. The ideal was, he thought, that all literary men should be scientific and scientific men literary. The highest ideal, to his mind, would be that Oxford scientific men should know Greek, for Greek literature was the most educating literature, and the Greek language the finest language that an Englishman could study. But he was afraid that was not practicable, and if they were not to know Greek, they should know our own splendid literature, the next in fertility and force to that of Greece. They should know, too, the lucidity of French and the philosophy of German. If they could not study Sophocles and Plato, let them at least study Bacon and Pascal, Goethe and Tennyson.

Sir A. Geikie, K.C.B., Sec.R.S., in seconding the motion, remarked that one great function of the Guild is to lose no opportunity of saying a word in season and out of season to educate the Government and the people to realise that, unless we have a scientific spirit and method, we cannot compete with nations which are working in that spirit and by that method.

After the adoption of the report, the following vice-presidents were appointed upon the proposal of Sir William Bousfield, seconded by Sir John Rhys :—Lord Curzon, the Rev. the Hon. E. Lyttelton, Lord Iveagh, and the Prime Ministers of Australia, Cape Colony, New Zealand, and Natal.

Sir E. Busk moved, and Mr. F. Verney, M.P., seconded, a resolution, which was carried, approving of the members of the executive committee. Prof. R. Meldola, F.R.S., then moved a vote of thanks to the

Lord Mayor, and in the course of his remarks referred to the attitude of science toward the public and of the public toward science; he pointed out that although there are branches of science which cannot be popularised, the practical results can be described.

The vote of thanks was heartily accorded, and the Lord Mayor having briefly acknowledged it, the meeting dispersed. The following telegram was dispatched to the Lord Mayor of Bristol:—

"Lord Mayor of London, on behalf of British Science Guild at annual meeting, sends warm congratulations to Lord Mayor and city of Bristol on generous munificence of Mr. Wills to Bristol University College, and hopes soon to welcome University of Bristol."

The following reply was subsequently received from the Lord Mayor of Bristol:—

"On behalf of my fellow-citizens and myself I beg to thank your lordship and the British Science Guild for your warm congratulations on the munificent promise towards the endowment of a Bristol University by our fellow-citizen, Mr. Harry Overton Wills."

J. MACFARLANE GRAY.

WE regret to announce the death of Mr. John Macfarlane Gray on January 14, at his residence in Edinburgh, in his seventy-sixth year. Mr. Gray had a varied experience as an engineer, and was for many years chief examiner for marine engineers at the Board of Trade. The work which first brought him into prominence was his invention in 1866 of the steam steering gear which was first applied to the *Great Eastern*. The results led eventually to the general adoption of the system. Mr. Gray contributed numerous important papers to the various institutions to which he belonged, and frequently took part in discussions at the meetings, his contributions being characterised by pawky humour and sound knowledge of the subject. His contributions to scientific knowledge were for a time curtailed by the action of the Board of Trade, who, on the ground that the individual opinion of any of their engineering officers must not be made public, refused him permission to discuss the report of a research committee of the Institution of Mechanical Engineers. Fortunately he had previously been able to publish the results of his important investigation of the Theta-Phi diagram.

The most valuable of Mr. Gray's papers were probably those on the theoretical duty of heat in the steam engine (Institution of Naval Architects, 1885); the ether pressure theory of thermodynamics applied to steam (*ibid.*, 1889); the rationalisation of Regnault's experiments on steam (Institution of Mechanical Engineers, 1889, and Royal Society, 1900); and the variable and absolute specific heats of water (Institution of Civil Engineers, 1901).

Mr. Gray was a member of the Institution of Mechanical Engineers. He was a vice-president of the Institution of Naval Architects, and vice-president of the Institution of Marine Engineers from its inception. Of humble origin, he was essentially a self-trained engineer, and his early training undoubtedly influenced his attitude towards scientific research, his independence of judgment being specially noticeable. His seventy-six years show a record of useful activity, and he may be said to have created a field of investigation for younger engineers, who have fully recognised the influence of his guidance. An excellent portrait of Mr. Gray accompanies the lengthy biography published in *Engineering* of January 17, from which source these brief particulars have been drawn.

NOTES.

WE regret to see the announcement of the death, on January 4, of Prof. C. A. Young, for many years professor of astronomy at Princeton University, at the age of seventy-three.

DR. FEODOR CERNYSHEV, St. Petersburg, has been elected a foreign correspondent of the Geological Society of London.

PROF. REGINALD W. BROCK, professor of geology in the Queen's University, Kingston, has been appointed director of the Geological Survey of Canada.

AT the annual meeting of the Royal Meteorological Society on January 15, the Symons memorial gold medal was presented to M. Leon Teisserenc de Bort, of Paris, "in consideration of the distinguished work which he has done in connection with meteorological science, especially the study of the upper air."

THE freedom of the city of Glasgow was conferred upon Lord Lister on Tuesday at a large and representative meeting of citizens, over which the Lord Provost, Sir William Bilsland, presided. In making the presentation, the Lord Provost recalled Lord Lister's connection with the city while professor of surgery at the University and visiting surgeon at the Royal Infirmary, where he achieved world-wide distinction as an investigator and a surgeon by discovering and perfecting the antiseptic system of treating wounds, which marked a new epoch in modern surgery. Lord Lister was unable to be present at the meeting owing to his condition of health, but a letter was read from him in which he said:—"Having in due time been elected by the managers of the Royal Infirmary as surgeon to that institution, I experienced uniform consideration at their hands when applying to the treatment of wounds the great truth which had been recently revealed by the illustrious Pasteur regarding the nature of fermentative changes in organic substance. That truth, though it seemed to me to shine clear as daylight from Pasteur's writings, was for many years not generally recognised, and thus it was my privilege to witness in my own practice, as the application of the principle became greatly improved, the revelation of pathological truths of fundamental importance and a revolution in practical surgery, and I looked upon the years spent in your city as the happiest period in my life."

ON Tuesday next, January 28, Prof. F. J. Haverfield will deliver the first of two lectures at the Royal Institution on Roman Britain. The Friday evening discourse on January 31 will be delivered by Prof. Rutherford, on recent researches on radio-activity, and on February 14 by Dr. C. W. Saleeby, on biology and history. The discourse on March 13 will be delivered by Signor G. Marconi, his subject being Transatlantic wireless telegraphy.

AT the annual meeting of the Entomological Society on January 15, the following fellows were elected as officers and to serve on the council for the session 1908–9:—*President*, Mr. C. O. Waterhouse; *treasurer*, Mr. A. H. Jones; *secretaries*, Mr. H. Rowland-Brown and Commander J. J. Walker; *librarian*, Mr. G. C. Champion; *other members of the council*, Dr. T. A. Chapman, Mr. A. J. Chitty, Mr. A. Harrison, Mr. W. J. Kaye, Dr. G. B. Longstaff, Mr. H. Main, Mr. G. A. K. Marshall, Prof. R. Meldola, F.R.S., Prof. L. C. Miall, F.R.S., Prof. E. B. Poulton, F.R.S., Mr. R. Shelford, and Mr. G. H. Verrall. The president read his address, which